

First record of *Lestes concinnus* (Zygoptera: Lestidae) from Sri Lanka with observations on its natural history

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Abstract

Lestes concinnus is a widespread species in tropical Asia and Oceania. It is a species known to have variable colour patterns ranging between pale and dark phenotypes which have earlier been recognized as distinct species. *Lestes concinnus* has never been known from Sri Lanka before. We report observations of both phenotypes of the species and intermediate morphs of *Lestes concinnus* from coastal habitats with dry reed patches in the northern part of the country, adding it to the Odonata fauna of Sri Lanka. With multiple field observations examined, we also provide comments on its identification and natural history in the country.

Keywords

New country record, Range extension, Dusky Spreadwing, Odonata, South Asia.

Introduction

Odonata fauna of Sri Lanka consists of 131 documented species in 12 families (Kalkman et al. 2020; Sumanapala 2021). Family Lestidae (Zygoptera) is represented in the country by six species representing three genera: *Lestes*, *Indolestes* and *Sinhalestes*. The genus *Lestes* is hitherto known from Sri Lanka by three species. Two of them, i.e. *Lestes elatus* Hagen, 1862 and *Lestes praemorsus decipiens* Kirby, 1894 are fairly

common species while *Lestes malabaricus* Fraser, 1929 is only known from a single specimen collected in 1932 from Jaffna in the Northern Province of Sri Lanka (Bedjanič et al., 2014).

Lestes concinnus Hagen in Selys, 1862, often known as Dusky Spreadwing, is known to occur widely in tropical Asia and Oceania from India, Nepal, Burma (Kalkman et al. 2020); Iran (Dumont et al. 2017); Australia, China, Indonesia, Myanmar, New Caledonia, Philippines, Solomon Islands, Taiwan, and Thailand (Dow 2017). It is a species with variable colour patterns ranging from pale brown to olive green with variable markings. In a study based on specimens collected from the westernmost region of its distribution range, Dumont et al. (2017) concludes that the species *Lestes thoracicus* represents darker phenotypic individuals of *Lestes concinnus* and thus it is a synonym of the latter. Dumont et al. (2017) also considered *Lestes umbrinus* a synonym of *Lestes concinnus*. These have also been followed by Kalkman et al. (2020) in their checklist of South Asian Odonata. Therefore all previous records of *Lestes thoracicus* and *Lestes umbrinus* in the Indian region can be reassigned to *Lestes concinnus* according to the present understanding. However, Kosterin 2019, based on Lieftinck's paper (1960), considers *Lestes umbrinus* to be a distinct species but states that it is reasonable to abstain from including it among Lestes in the region, given that no known specimen of it has been reported from the region and the type locality of the species is unclear.

Multiple observations of *Lestes* with variable phenotypes have been reported from the northern part of Sri Lanka during recent years. Based on detailed observations and comparisons, we report these observations as records of *Lestes concinnus*, an addition to the list of Sri Lankan odonates, and provide notes on its identification and natural history.

Methods

Field surveys were carried out as a part of an ongoing island-wide survey of Odonata in Sri Lanka. All observations were made in the field and observed individuals were photographed using Canon EOS 7D Mark ii camera fitted with Canon EF 100mm f/2.8L IS USM Macro Lens. The specimen examined were released back to the original habitat. Locations were reported using a Garmin 62S GPS receiver and the distribution map was created in QGIS version 2.18.21. Identification of the species was made using multiple taxonomic literature including Asahina (1985), Dumont et al. (2017), Joshi (2013), Kosterin (2019), Laidlaw (1920) and Lieftinck (1960).

Results

Field Observations

Two males of *Lestes concinnus* representing the pale phenotype and the dark phenotype, and a female of the pale phenotype were first recorded at Talaimannar (Mannar District, Sri Lanka) during a survey on 02 March 2016. They were found among dense reed patches in a coastal scrubland. A re-examination of previous photographic observations and further surveys resulted in several additional observations of the species in the same area during the years 2016 and 2017. A recent survey in Kavutharimunai (Kilinochchi District, Sri Lanka) also provided some observations of the species in a habitat broadly similar to that of Talaimannar (Table 1).

Table 1. A summary of observations of *Lestes concinnus* in Sri Lanka

Date	Location	Individuals observed
19.i.2016	9.07589, 79.72213	1 ♂
02.iii.2016	9.07589, 79.72213	2 ♂, 1 ♀
09.iv.2016	9.05205, 79.78493	1 ♂, 1 ♀
09.iv.2016	9.07628, 79.72220	2 ♂, 5 ♀
10.iv.2016	9.04198, 79.80208	4 ♀
10.iv.2016	9.04465, 79.79833	1 ♂, 6 ♀
18.ii.2017	9.04191, 79.80261	1 ♀
27.iii.2021	9.59208, 80.07218	4 ♂, 4 ♀
23.iv.2021	9.59208, 80.07218	3 ♂, 3 ♀
23.iv.2021	9.58571, 80.08629	1 ♂, 1 ♀
23.iv.2021	9.57271, 80.10182	2 ♂, 1 ♀
23.iv.2021	9.55911, 80.12227	1 ♂, 1 ♀

Species Identification

Lestes concinnus have two primary colour forms and variable intermediate forms (Figs 1–3). The paler phenotype, which was widely recognised earlier as the typical *Lestes concinnus* form, is generally brown with darker markings. The darker phenotype, which has sometimes been assigned to *Lestes thoracicus*, is pale olive green with black and bluish markings (Table 2). The intermediate forms have a variable amount of bluish markings, especially in the head, and variable darker stripes on the dorsum of synthorax.



Figure 1. Males of dark (A) and pale (B) phenotypes of *Lestes concinnus* observed at Thalaimannar and Kavutharimunai.

Despite the variations in the colour patterns, the structure of male anal appendages was similar in the specimens observed in the field (Figure 3). The cerci were slightly longer than segment 10 and are bent inward at the apical end. The apical half of the outer margin of cerci was equipped with small spines and the inner margin possesses minute denticulation in the middle. A posteriorly directed spine was present on the inner margin of cerci, close to its base. Paraprocts were well visible from above and had a broad blunt apex in the lateral view. The anal appendages of the observed specimen agree with those of *Lestes concinnus* as depicted by Asahina (1985), Dumont et al. (2017), Laidlaw (1920) and Lieftinck (1960). Observed specimens agree with the key to the genera provided by Fraser (1933) and modified by Kosterin (2019).

Joshi (2013) who compared *Lestes concinnus* and *Lestes thoracicus* as they were previously recognized, provide several characters which could be used in differentiating them. The range of morphological variation observed within the Sri Lankan observations agrees with both sets of characters specified under each of these taxa by Joshi (2013), supporting the synonymy of *Lestes thoracicus* with *Lestes concinnus*.

Lestes concinnus can be differentiated from all other *Lestes* species in Sri Lanka by having a pale brown or olive green thorax with darker, often diffused, stripes along either side of the dorsal carina. No metallic markings on the thorax. The last abdominal segments usually have a thin black line along the mid-dorsal carina in most specimens and the cerci of the males are pale with dark apices. Eyes are pale



Figure 2. A female *Lestes concinnus* observed at Mannar Island.

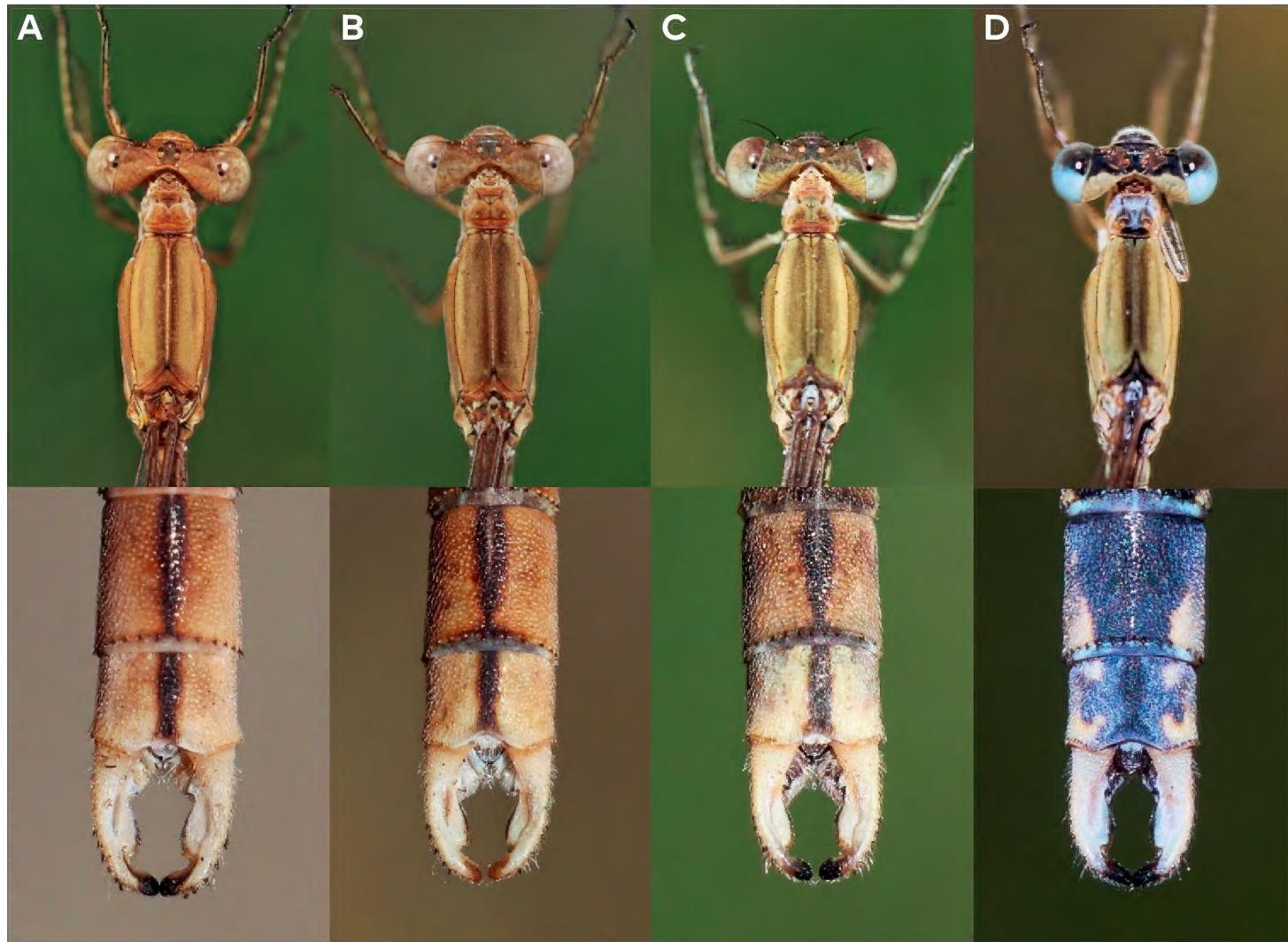


Figure 3. A comparison of phenotypic variation among males of *Lestes concinnus* in Sri Lanka. Each pair of images represents the dorsal view of the head, thorax and anal appendages of a single individual (A, B, C from Kavutharimunai, D from Talaimannar).

Table 2. Morphological characters of pale and dark phenotypes of *Lestes concinnus* observed in Sri Lanka

Character	Pale Phenotype	Dark Phenotype
Head	Labrum and gena brown. Frons, clypeus, vertex, occiput light brown.	Labrum and gena pale bluish. Frons and clypeus black with some slaty blue markings. Vertex black. Occiput pale olive green.
Eyes	Pale brown with even paler ventral side.	Pale blue with anterior dorsal half dark. Ventral sides pale.
Prothorax	Brown.	Olive green with black and pale bluish markings.
Synthorax	Brown with somewhat diffused dark brown stripes on either side of the mid dorsal carina. Ventral side paler.	Olive green with somewhat diffused black stripes on either side of the mid dorsal carina. Ventral side paler.
Pterostigma	Light brown with paler outer margins.	Dark brown with paler outer margins.
Abdomen	Generally light brown with dark dorsal carina. Slaty bluish sides to segment 2-6.	Dark along dorsal carina. Paler sides with slaty blue on segment 3-6. Pale brown lateral markings on segment 8-10. Pale bluish markings on segment 8, 9 and 10.
Anal appendages	Cerci pale brown with darker apices.	Cerci creamy white with dark apices.

brownish or bluish. Dark phenotypic specimens have a slaty bluish abdomen and prothorax markings. Wings are clear with brownish or dark pterostigma with paler outer margins.

Natural History

Lestes concinnus is known to inhabit habitats with long dried grass (Fraser 1933) and streams, ponds and reservoirs in low canopy forests (Koparde 2015). In Sri Lanka, *Lestes concinnus* is only known from the coastal habitats with dry grasslands and dense reed patches (Figs 4, 5) in the north-western part of the country (Fig. 6). Adults have been observed among the reeds closer to water bodies, as well as in dry grasslands with scattered scrub. Despite regular surveys conducted by the authors in several areas of Mannar and Kilinochchi Districts throughout the past couple of years, the species has never been encountered in any other habitats. It can be assumed that *Lestes concinnus* in Sri Lanka breeds in the coastal wetlands of the drier parts of the country, with adjoining vegetation consisting of dense grass and reed patches.

Several species of Odonata were observed in the same microhabitat in sympatry with *Lestes concinnus*. These include *Ceriagrion coromandelianum*, *Agriocnemis pygmaea*, *Ischnura senegalensis*, *Lestes elatus*, *Diplacodes trivialis*, *Orthetrum sabina* and *Crocothemis servilia*. *Lestes concinnus* usually perches on vertical reed stems about 0.3–0.5 m above the ground. They fly at the same height and perch on another reed stem about a meter or two away upon disturbance. Roosting also takes place among the same vegetation.

The species appears to be highly seasonal in Sri Lanka. Adults have only been observed in January, February, March and April, which generally represent the latter part of the north-eastern monsoon and the period immediately following the monsoon. The highest abundance have been recorded in April.

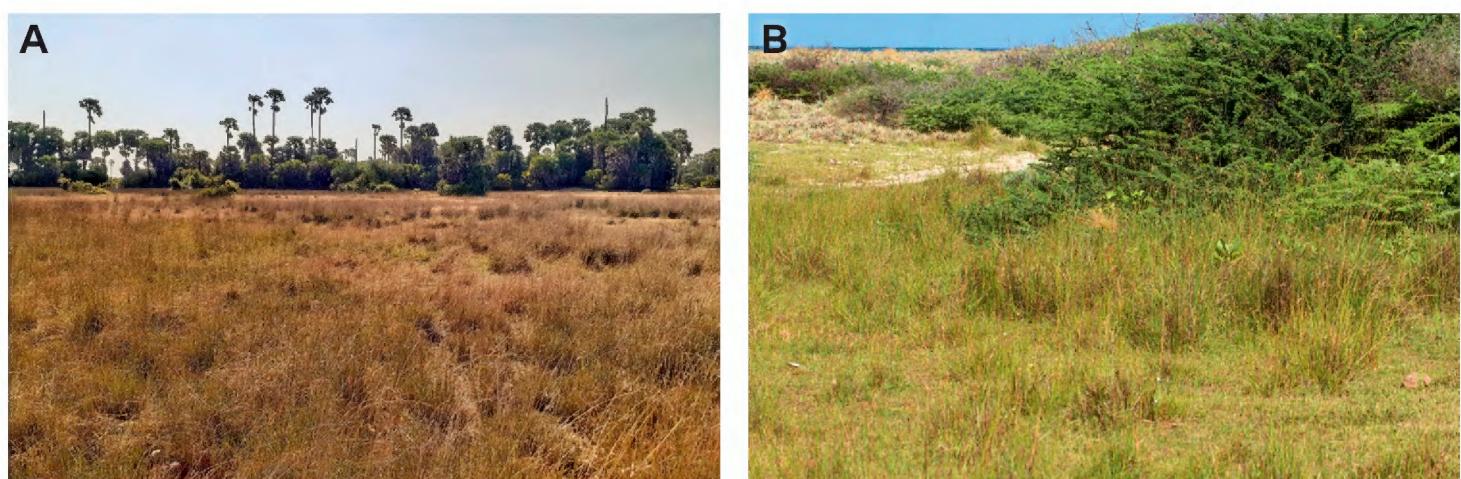


Figure 4. Habitat of *Lestes concinnus* in Kavutharimunai. A: expansive dry grasslands. B: dense reed patches with scattered scrub.



Figure 5. Habitat of *Lestes concinnus* in Talaimannar and the authors documenting the first known observation of the species in Sri Lanka. Image credit: Koushalya Mahagedara.

Discussion

Despite previous odonatological and natural history explorations in Sri Lanka, *Lestes concinnus* has never been documented in the island hitherto. The seasonality of adults and the habitat specificity shown by the species in the country are two factors that might have contributed to this. It is also possible that the species has recently dispersed to Sri Lanka and that might be the reason for all known observations to be limited to coastal habitats. If that is the case, it can be expected to be reported in other lowland grasslands associated with wetlands in the north-eastern part of the country.

Lestes concinnus is easily recognizable from the other *Lestes* species known from Sri Lanka based on the colour patterns of the adults. Even though the species have a pale morph, a dark morph and intermediate morphs, the pale morph is the most common form encountered in the field. In addition to the phenotypic characters, it can also be differentiated from its known congeners in the country based on the structure of the anal appendages. Further studies based on integrated morphometric and molecular taxonomic methods across the entire range of the species are recommended to better understand the taxonomy of the species and its congeners.

As of the present understanding, *Lestes concinnus* is only known from two coastal areas in Sri Lanka. The limited distribution range and habitat specificity of the species in the country suggest that it is a likely candidate to be recognized as a species with

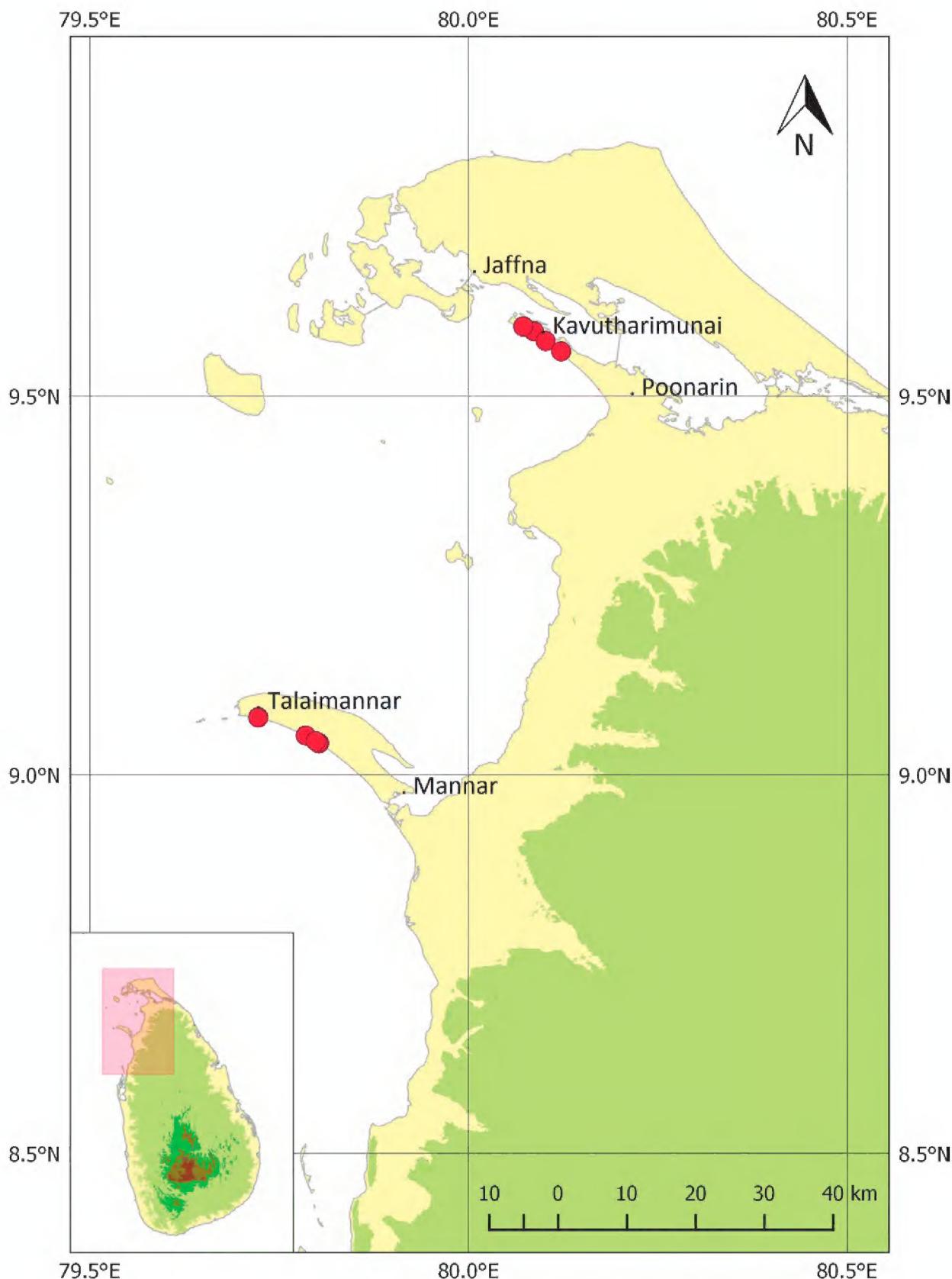


Figure 6. Distribution of known *Lestes concinnus* observations in Sri Lanka.

high conservation importance in national level conservation assessments. Further research, continuous population monitoring and assessing its distribution range will provide additional data that can support better conservation assessments in future.

The habitat in Kavutharimunai, where *Lestes concinnus* was recently recorded (Fig. 4), represents a unique landscape of expansive coastal grasslands which continues inland and gradually forming a ridge of sand dunes. It should be noted that such a unique landscape require better protection at the national level to conserve the landscape, the ecosystem and the species it supports.

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